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13. ABSTRACT (Maximum 200 words)

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PDF methods provide a useful calculation tool for flows involving turbulent combustion. To date, an area that has received little attention is the application of these methods close to walls. The objective of the research was to develop near-wall treatments, thus facilitating the use of PDF methods to calculate various phenomena involving turbulent reactive flows near walls. Two successful approaches have been developed, implemented and demonstrated. The first uses wall functions, the second uses elliptic relaxation and solves the PDF equations all the way to the wall.

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1 Status of Effort

The graduate student, Tom Dreeben, is very close to completing the research. He is expected to complete his Ph.D. thesis in November 1996.

2 Accomplishments

A PDF-closure—the Stochastic Lagrangian Wall Model—has been developed, following Durbin's ideas of elliptic relaxation. The model has been reformulated as a Reynolds stress closure and tested against DNS data of channel flow. The paper describing this model has been accepted for publication in Physics of Fluids. The same model has been implemented in a PDF method. This involved considerable numerical difficulties which have been overcome. A paper describing the model, the numerics, and comparisons with experimental data is in preparation.

3 Personnel Supported

Thomas D. Dreeben, Graduate Student

4 Publication

T. Dreeben and S.B. Pope (1996) "PDF and Reynolds-stress modeling of near-wall turbulent flows," Physics of Fluids, (submitted).

5 Inventions and Patents

None.